Pronominal Features: How “Interpretable” are They?

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Starting Point:

(1) Minimalist Theorem:
A morpho-syntactic feature must be **checked** by the computational system (= within syntax) iff it can **not** be **interpreted** outside the system.

(2) Corollary:
If a morpho-syntactic feature need **not** be **checked** within syntax, it has an interpretation at LF (= it has a **semantic interpretation**)

Problems:

- Syntacticians usually don’t specify semantic interpretation
- We therefore don’t have a precise account of what it means to be “interpretable” (in the minimalist’s sense of the notion)
- In standard model theoretic semantics, many features that need not be checked by syntactic criteria (eg. $\Phi$-features on DPs like 3rd person, singular) lack any reasonable interpretation
The plan of today:

- Illustrate the connection between checking and interpretation
- Give some criteria for what it means to be an interpretable feature
- Illustrate some potential problems for the minimalist theorem
- Look for possible solutions
- Discuss the issue of compositionality of feature interpretation

We will focus on the features of pronouns in German (and English).
Minimalist Feature Checking:

(3) English: I help the children
German: ich helfe den Kindern

\[
\begin{array}{ll}
1.\text{PS},\text{SG},\text{NOM} & [\text{1.PS,SG,NOM}] \\
\ast \text{DAT} & [\ast \text{DAT}] \\
1.\text{PS,SG} & [1.\text{PS,SG}] \\
\ast \text{NOM} & [\ast \text{NOM}] \\
\ast 1\text{PS,SG,NOM} & [\ast 1\text{PS,SG,NOM}]
\end{array}
\]

- Case features must be checked (they are uninterpretable)
- Number features need not be checked (they are interpretable)
- Person features need not be checked (also interpretable)
- However, in order to get agreement straight, we need checking features on the verb, more precisely on the agreement morphology of the verb (also uninterpretable)
Criteria for “interpretability”:

C1 A feature F of a lexeme L is *essential* for the interpretation of L iff there is no other lexeme L’ without F but with the same meaning as L.

Claim: Only if F is essential, can it be interpreted.

- A counterexample to interpretability:
  Wh-features of Wh-pronouns: the Wh-feature of *who* is uninterpretable, because there is another lexeme, namely *somebody/someone* (in Karttunen’s 1977 theory) or *he* (in Groenendijk/Stokhof’s 1982 theory) with the same meaning as *who* (cf. also Korean).

- An embarrassing consequence of the Minimalist Theorem:
  All Wh-items, even those left in situ, must be checked.
F is non-trivial iff the meaning representation of F contains (at least) one non-eliminalbe, non-logical constant.

Claim: Only if F is non-trivial, can it be interpreted.

Examples and a counterexample:

- Identity functions are uninterpretable
- type-shifting operations are uninterpretable
- Karttunen’s Wh-Operator (the Q-operator that resides in COMP) is uninterpretable.
A further condition on the use of interpretable features:

**C3** *Uniformity* of feature interpretation:
There can’t be two homophoneous lexemes that differ only with respect to presence or absence of interpretable features.

Example:
Assume a moved item $\alpha$ (eg. a wh-phrase in specC) has some feature F, whereas an-in-situ item $\beta$ (eg. a wh-phrase in situ) lacks F. Then the interpretation of F cannot be uniform, if $\alpha$ and $\beta$ are homophonous. We would say that the same word cannot have F in one context but lack F in another. Or at least, if it does, the feature is purely syntactic, ie. uninterpretable.
C-I Interpretability is *compositional* iff the meaning of a word $W$ is a function of the meaning of its features.

Assuming that functional application is a universal means for compositional interpretation, features $F_i$ have a compositional interpretation if:

$$[W] = [F_1] ([F_2] (\ldots (F_n) \ldots )),$$

with $F_i$ interpretable features of $W$.

We will see below that compositional interpretation is a problem for $\Phi$-features, i.e., they do not have a compositional interpretation. This calls into question the very idea of there being a feature that is to be interpreted; in fact we interpret an entire *word* rather than a (grammatical) feature.
Some Problem Cases

(5) a. $\text{Man}_{\text{sg}}$ kennt$_{\text{sg}}$ einander
    One knows each other

b. Wie geht es $\text{Ihnen}_{\text{3rd,pl}}$?
   how are (it) you?

c. Komm er bitte her!
   Come he please here!

d. In this article $\text{we}$ have shown that . . .

e. The $\text{author}_{\text{sg}}$ $\text{themself}$ probably knows no more of the language than exactly this point which $\text{they}_{\text{pl}}$ have taken from a descriptive grammar (cited from Featherston 2007)

f. Only you are aware of your secrets
   Semantic analysis: Everyone else except you is aware of his secrets

g. John and Mary believe that $\text{they}_{\text{pl}}$ will win
   Distributive reading: John believes that $\text{he}_{\text{sg}}$ will win and Mary believes that $\text{she}_{\text{sg}}$ will win
The problem:
Features of bound variable pronouns seem to be uninterpretable, whereas the same features of the same pronouns are assumed to be interpretable, when the pronoun is not bound.

By uniformity of interpretation, this should be impossible.

The solution proposed in the literature (Heim, Kratzer, v. Stechow unpublished):
The offending features are either deleted on the way to LF or they are added on the way to PF.

Objections:

Theoretical: Manipulation of features is a syntactic operation that should be local. Binding of pronouns is typically non-local.

The solution still violates the uniformity condition which should also hold at LF.

Empirical: Manipulations of features is totally ad hoc when it comes to give an account of Rullmann’s problem to be discussed further below.
5 components of our solution:

- a feature analysis of the **inflectional** system of German
- a semantic analysis of **plural pronouns**,
- a little bit of **pragmatics**,
- a **grammatical** restriction that governs coreference and binding,
- an appropriate definition of the **semantics of pronouns**.
### Solutions

**Morphology**

<table>
<thead>
<tr>
<th></th>
<th>[+IND, +PRESENT]</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1]</td>
<td>ich (=I)</td>
<td>glaub</td>
</tr>
<tr>
<td>[+2]</td>
<td>du (=you)</td>
<td>glaub(te)</td>
</tr>
<tr>
<td></td>
<td>er (=he)</td>
<td>glaub</td>
</tr>
<tr>
<td>[+PL]</td>
<td>wir (=we)</td>
<td>glaub(te)</td>
</tr>
<tr>
<td>[+1]</td>
<td>ihr (=you)</td>
<td>glaub(te)</td>
</tr>
<tr>
<td>[+2]</td>
<td>sie (=they)</td>
<td>glaub(te)</td>
</tr>
</tbody>
</table>

(7) $/t/$ = [+PL, +2]

$/en/$ = [+PL]

$/st/$ = [+2]

$/e/$ = [+1, +IND, +PRESENT]

$/t/$ = [+IND, +PRESENT]

$/Ø/$ = []
Consequences:

- **Claim:** Nowhere in the morphology of German do we need features like [SINGULAR] or [3RD PERSON]
- **Nowhere** in the semantics do we need an interpretation of these features
- **There is nothing wrong** with standard model theoretical semantics, which gives cognitive preference to atomic reference (to 3rd person)
- **Pronouns** like *man* in (3-a), although being exceptional in allowing plural reference, are no longer contradictory: their morphological property of being singular is not encoded as a feature that would enforce such an interpretation!

(3) a. Man kennt einander
   one knows each other

- 3rd person pronouns like *er* (=‘he’) must not necessarily be interpreted as having 3rd person reference = different form addressee and speaker
(8) John doesn’t have children
   Correct paraphrase: It is not the case that John has *more than zero* children
   Wrong paraphrase: It is not the case that John has *more than one* child

Accordingly, the reference of plural terms also includes atoms/singularities
(as is usually assumed in plural semantics, cf. Schwarzchild)

Consequences:

- The choice between singular and plural forms is largely a matter of
  pragmatics, cf.:  
  (9) a. Do you have a cigarette?  (asking a friend/#asking in a shop)
      b. Do you have cigarettes?  (asking in a shop/#asking a friend)

- Semantically, plural and singular variants may have identical
  interpretations; the preference for more indirect ways of conveying
  meaning is by and large conventionalized (politeness, distance,
  rudeness etc.)
Consequences:

- Auctorial *we* can be used as referring to a singleton precisely because the context already specifies the author.

- Politeness forms like *Sie*$_{3rd,pl}$ can be used in the same way for the same reason, namely because the context already specifies the addressee (addressee compatible with both 3rd person and plural).

- Because of the built-in semantics of atomic reference in the model theory, singular pronouns like ‘he’ must still refer to singularities (cf. below).

- We fully subscribe to Horn’s division of pragmatic labor: (morphologically) unmarked form = unmarked semantics.
Pragmatics conforms to the Strongest Meaning Hypothesis, unless the strongest meaning is incompatible with context (knowledge, common ground etc.)

- singular form interpreted as “Atom” is stronger than plural form interpreted as “Sum+Atom” (inclusive plural)
- plural form interpreted as “Sum” (exclusive plural) is stronger than interpreted as “Sum+Atom”

(10) a. There are children in the garden
    b. Are there children in the garden?
    c. #Do you have M.A.-degrees?

Weakening in (b.) justified as a consequence of ignorance, weakening in (c.), however, is disallowed.
(11) a. [John and Paul]_i believe that they_\textsubscript{i} will win
   b. Paraphrase: Each of John and Paul believes that he will win
   c. * [John and Paul]_i believe that he_\textsubscript{i} will win

The Strongest Meaning Hypothesis implies that, if a distributive reading is intended, the singular most explicitly expresses this meaning and should be used, yet (11-c) is ungrammatical.

G Grammatical restriction:
Failure of agreement of $\phi$-features must, if possible, be interpreted as disjoint reference.

(12) *Only you_\textsubscript{i} are aware of his_\textsubscript{i} secrets

A problem:

(13) Sind Sie\textsubscript{pl} es, der\textsubscript{sg} meine Rechte verletzt hat?
   Is you it who my rights violated has
The problem of bound variable pronouns:
The \( \phi \)-features of pronouns must be ignored (ie. cannot receive a semantic interpretation) iff the pronoun is interpreted as a bound variable.

The solution (sketch of an idea):
This property seems to be part of the semantics of (bound variable) pronouns and therefore has to be accounted for in a purely semantic way.

This entirely semantic approach necessitates a purely semantic treatment of binding (as provided by the textbook of Heim/Kratzer) that allows a semantic way of saying that a pronoun is bound or free.
Execution of this idea:
In H&K, variable assignment functions $g$ operate on finite domains $D$ in such a way that $g$ is defined for a b.v.p. $x_i$ only if an antecedence (a binder) has enlarged a previous assignment function $g'$ so that $x_i \in D(g)$, but $x_i \notin D(g')$.

Formally:
\[ \llbracket \forall x_i p \rrbracket_g = 1 \iff x_i \notin D(g) \text{ and } \llbracket p \rrbracket_{g'} = 1 \text{ for all minimal extensions } g' \text{ of } g \text{ such that } x_i \in D(g'). \]
\[ \llbracket x_i \rrbracket_g = g(x_i) \iff x_i \in D(g'), \text{ undefined otherwise} \]

Accordingly, the semantics “knows” whether or not a pronoun is bound:
- A pronoun is bound iff its translation $x_i$ is in the domain of an assignment function.
- Otherwise (i.e., if there is no antecedent), $x_i$ can only be interpreted by the context $c$: $c$ is defined for $x_i$ iff $g$ is undefined for $x_i$. 

Pronouns cannot be interpreted without an index. We thus get the following definitions for singular pronouns:

- \([\text{er}_i]_{g,c} = [[\text{PRON}, i]]_{g,c} = g(x_i), \text{ if } g \text{ is defined for } x_i, \text{ and the most salient singularity in } c \text{ otherwise}\)

- \([\text{ich}_i]_{g,c} = [[\text{PRON}, +1, i]]_{g,c} = g(x_i), \text{ if } g \text{ is defined for } x_i, \text{ and the speaker in } c \text{ otherwise}\)

- \([\text{du}_i]_{g,c} = [[\text{PRON}, +2, i]]_{g,c} = g(x_i), \text{ if } g \text{ is defined for } x_i, \text{ and the hearer in } c \text{ otherwise}\)

Question: Can +1 and +2 be given a compositional interpretation? Formally, this is impossible in the present framework!

Compositionality can be regained, however, if indeces become part of the object language, a matter we cannot discuss here (cf. Sternefeld 2001). Another option is duplication or spreading of the index, to which I’ll return below.
**Bound Variable Pronouns**

**Discussion of an example**

(14) Only I knew that I would win

a. noone else knew that I would win  \hspace{1cm} \text{(referential reading of 2nd occurance of I)}
b. noone else knew that he would win \hspace{1cm} \text{(bound variable reading of 2nd I)}

If j as the referential index of “I” and k its binding index, the ambiguity is presented by (15):

(15) a. Only I\textsubscript{j,k} knew that I\textsubscript{j} would win
    b. Only I\textsubscript{j,k} knew that I\textsubscript{k} would win

Following Rooth 1992, the first occurance of “I” is the focus of *only*

(16) a. Only\textsubscript{C} ([ I\textsubscript{j} ]\textsubscript{FOCUS} \in \{x\textsubscript{k} : x\textsubscript{k} knew that I\textsubscript{j} would win\}) \hspace{1cm} \text{(I interpreted as c(x\textsubscript{j}))}
b. Only\textsubscript{C} ([ I\textsubscript{j} ]\textsubscript{FOCUS} \in \{x\textsubscript{k} : x\textsubscript{k} knew that I\textsubscript{k} would win\}) \hspace{1cm} \text{(I interpreted as g(x\textsubscript{k}))}

Rooth’s focus semantics of “only”:

(17) For none of the contextually relevant alternative y to I\textsubscript{j} in C it holds that y \in \{x\textsubscript{k} : x\textsubscript{k} knew that I\textsubscript{j}/x\textsubscript{k} would win\)
The solution proposed here is not ad hoc; the ambiguity is in fact a lexically desambiguated in the East Asian Languages:

(18) Only John hates himself
   a. There is no x except John who$_x$ hates x (bound variable reading BVR)
   b. There is no x except John who$_x$ hates John (referential reading RR)

Japanese:

(19) a. Jiro-dake-ga zibun-o nikunde-iru (√:BVR, ?*:RR)
    Jiro-only-NOM self-acc hates
    Jiro-nur-Nom er-selbst-Acc hasst

Korean:

(20) a. Fritz-man caki-lul sillehanta (√:BVR, ?*:RR)
   b. Fritz-man ku casin-ul sillehanta (√:RR, ?*:BVR)
Compositionality and Decomposition
Plural and Compositionality

Notational convention:

- $g(x_i)$ and $c(x_i)$ denote singularities in the domain of entities $D_e$.
- $g(X_i)$ and $c(X_i)$ denote pluralities in $D_{(e,t)}$ (sets or singletons).
- For each index $i$ either $g(\alpha_i)$ or $c(\alpha_i)$ is defined.

(21) Definition for plural pronouns:
- $[PL, PRON, i]$ denotes $g(X_i)$, if $g$ is defined for $X_i$, and $c(X_i)$ (= the most salient entity in $c$) otherwise.

Above we argued that $+1,+2$ can not be interpreted compositionally unless one has access to an index. Assume now that the index can spread, ie. can be duplicated, so that

(22) a. $[+1, PL, PRON, i] = [+1, i] \cup [PL, PRON, i]$ 
    b. $[+2, PL, i] = [+2, i] \cup [PL, PRON, i]$

Here is a more compositional semantics for $+1$ and $+2$:

(23) a. $[+1, i]$ presupposes that if $c$ is defined for $i$ and that the speaker at $c$ is equal or included in $c(\alpha_i)$
    b. $[+2, i]$: same for the hearer.
Evidence for spreading:

(24) Only \( l_i \) wanted \( us_{i,j} \) to marry

a. No \( x_i \) except me wanted me and \( x_j \) (\( x_j = \) my wife) to marry

(Referential reading)

b. No \( x_i \) except me wanted \( x_j \) and \( x_j \) (\( x_j = \) my wife) to marry

(Bound variable reading)

Bound variable reading splits the interpretation of \( us \) into a plural meaning and a bound variable meaning!

In Korean, the ambiguity is nicely resolved by using referential and bound variable pronouns:

(25) a. na-man-i [\textit{wuli-ka} kyelhonhay-ya ha-n-ta-ko] sayngkakha-n-ta
\textit{I-only-Nom we-Nom marry should-Pres-Dec-C believe-Pres-Dec}
‘I’m the only person who believes that I and someone else should marry.’

b. na-man-i [\textit{caki-tul-i} kyelhonhay-ya ha-n-ta-ko] sayngkakha-n-ta
\textit{I-only-Nom self-PL-Nom marry should-Pres-Dec-C believe-Pres-Dec}
‘I’m the only person who \( i \) believes that he \( i \) and someone else should marry.’
Compositionality and Decomposition
Rullmann’s Problem

How can we account for this?

(26) Splitting the meaning of \textit{us} = \text{Union of interpreted features}
\[ [+1, +\text{PL}, \text{PRON}, i, j] = [+1, \text{PRON}, i] \quad (= x_i = \text{bound variable}) \]
\[ \cup [+\text{PL}, \text{PRON}, j] \quad (= X_j = \text{free variable}) \]

Semantik interpretation:
\[ [ [+1, \text{PRON}, i] \cup [+\text{PL}, \text{PRON}, j]] = [[[+1, \text{PRON}, i]] \cup [[[+\text{PL}, \text{PRON}, j]]] \]

This works because the plural needs not be interpreted as a plurality, only the resulting interpretation must be (which must be added as an additional restriction for the semantics of \texttt{\cup}).
This works systematically with all other feature combinations, cf.

(27) a. Nur \textit{du_i} wolltest, dass \textit{ihr_{i,j}} heiratet
Only you_{sg} wanted that you_{pl} marry
Meaning: You_{sg} are the only x, who wanted that \textit{x+y} marry
b. Nur \textit{er_i} wollte, dass \textit{ihr_{i,j}} heiratet
Only he wanted that you_{pl} marry
Meaning: He is the only x, who wanted that \textit{x+you} marry
c. Only \textit{he_i} wanted them_{i,j} to marry
Meaning: He is the only x, who wanted that \textit{x+y} marry
Thanks for listening and for your hospitality!

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Some Residual Problems

Problem 1: How dependent is this kind of analysis on arbitrary features of the underlying morphology? Consider English, where only the unmarked form 3.sg.pl. has survived in history! Perhaps, we should assume a new kind of feature ("unmarked(α)") for a dimension α (person, number, tense etc.) which may count as checked iff there is no feature counterpart in the dimension of α. Does this overgenerate?

Problem 2: What about gender as an (un)interpretable feature?

(28) Der Mann \(i\) schläft. Er \(i\) schnarcht.

Gender is a feature that is subject to principle G.

(29) \([\text{gender} : \alpha, \text{pronomen}, i] := \lambda x. x\) the property described by a noun N having the gender \(\alpha\), which determines the kind of givenness (“Art der Gegebenheit”) of \(x\) in \(c\): \(x\).

Locality of G:

(30) Der Physiotherapeut \(i\) ist eine Person \(i\), die ihre \(i/#\seine \(i\) Leistung auf ärztliche Anordnung hin erbringt und daher selber keine Diagnose stellen darf.

Locality is not sufficient for Anaphora to work:

(31) Hier ist ein Löffel, hier eine Gabel. *Sie ist größer als er.
Some Residual Problems

**Problem 3:** What about *tense* — Does (un)interpretability work as with pronouns?

(32) a. Hallo Ede! Ich **wollte** mir von dir bis morgen 10 Euro leihen!
    b. Hallo Fritz! **Wollte** dich nur kurz dran erinnern, dass du mir 10 Euro schuldest!

**Problem 4:** The *syntax von Wh-in-situ* — The analysis predicts that the distribution of wh-in-situ is not totally free. A correct result?

**Problem 5:** An empirical problem for condition G:

(33) a. *Some student* left *their* umbrella (zitiert aus Johnson 2004)
    b. The author *themself* probably knows no more of the language than exactly this point which *they* have taken from a descriptive grammar (zitiert aus Featherston 2008)

Here the effect of domain widening must be stronger than G. (Does this call for an OT-analysis?)

**Problem 6:** Where is the borderline between semantics and pragmatics?

(34) a. Wenn du Erfolg haben willst...
    b. Wenn du denkst es geht nicht mehr (kommt von irgendwo ein Lichtlein her)
Bibliographic comments


